ANL ITAPS project

Goals

The ITAPS center is a collaboration between several universities and DOE laboratories, and is funded by the DOE SciDAC program. The primary objective of ITAPS is to develop technologies that enable application scientists to easily use multiple mesh and discretization strategies within a single simulation on petascale computers. This is accomplished through the development of common functional interfaces to geometry, mesh, and other simulation data. This web site describes ANL?s implementation of these interfaces.

Interfaces & Implementations:

We develop the following implementations of the ITAPS interfaces and components that use them:

- CGM: The Common Geometry Module, or CGM, is a set of libraries for querying and modifying CAD and other types of geometry data; CGM provides a common API and topological model for accessing geometry represented in ACIS, Open.CASCADE, and a variety of other solid modeling engines. CGM provides the geometry infrastructure for the CUBIT mesh generation toolkit. CGM implements the ITAPS iGeom interface.

- MOAB: The Mesh-Oriented datABase, or MOAB, is a library for representing unstructured and structured mesh, and field data on a mesh. MOAB represents the finite element zoo, plus polygons and polyhedra. MOAB's data model is simple yet powerful, being able to represent most kinds of metadata often accompanying the mesh (e.g. boundary conditions, processor partitions, geometric topology). MOAB's interface strikes a balance between abstractness (for extensibility) and concreteness (for ease of use). MOAB's parallel mesh capabilities have been shown to scale to at least 16k processors. MOAB implements the ITAPS iMesh interface.

- Lasso: A component for recovering and querying relations between mesh and geometry (and other data, eventually). Maintaining independence between MOAB and CGM allows each to be used without depending on the other. However, for applications like mesh generation and adaptive mesh refinement, relations between mesh and geometry must be queried and maintained. Lasso provides the functionality for recovering and querying these relations for meshes generated with CUBIT and MeshKit. Lasso implements the ITAPS iRel interface.

- MeshKit: An open-source library of mesh generation tools and algorithms. This library is designed with two uses in mind: first, for those wanting an open-source mesh generation library, and second, for those implementing new meshing algorithms. MeshKit? is a work in progress, with a version 1.0 release scheduled for mid-summer 2011.

- PyTAPS: a Python implementation of ITAPS that can be used with MOAB, CGM, and Lasso. Installation instructions are also available.

Applications:

ANL's ITAPS interface implementations and the components they rely on have been used in various services and applications, including Mesquite, MeshKit, and the Nek spectral element fluids code.

For more information on ANL's ITAPS work, contact Tim Tautges, tautges _at_ mcs.anl.gov.

For the original Trac instructions, see TracInstructions..